B A method of organizing the dimensions of electromagnetic quantities

(This Appendix is part of the Universal System of Units Standard.[10])

B.1 Introduction

It has been suggested that one reason that electromagnetism is difficult to understand is the complexity of the unit system. Some of the unit systems that have been proposed in the past are listed in Table 3, but because the International System of Units (SI) based on the MKSA system of units has recently become widely adopted, the kind of confusion seen in the past has disappeared. Although the era of proposing unit systems for the real world has ended, and the viewpoint of reorganizing the relations between rationalized unit systems and non-rationalized unit systems and the relations between ternary unit systems and quaternary unit system can be considered educationally significant even at this time. In this paper, we take the position of regarding solid angle as a physical quantity that has an independent dimension, consider a reorganization of the relationships among various unit systems and dimensions of electromagnetic quantities. Although this is necessary for a reorganization of the relationship between rationalized unit systems and non-rationalized unit systems, one can understand that it is also useful for reorganizing the relationship between the dimensions of electromagnetic quantities as shown in Figure 1. (This standpoint does not conflict with the International System of Units (SI). Strangely, however, according to Table 3[9] this has not been discussed deeply in the past.)

Table 3: Unit systems that have been proposed in the past

No. of dimensions	Name	Physical quantities that have independent dimensions
3	CGS electrostatic	Length, mass, time
	CGS electromagnetic	Length, mass, time
	CGS Gaussian	Length, mass, time
4	CGS-Fr	Length, mass, time, and electrical quantity
	CGS-Bi	Length, mass, time, and electrical current
	MKSμ	Length, mass, time, magnetic permeability
	MKSϵ	Length, mass, time, permittivity
	MKVA	Length, mass, voltage, electrical current
	MKSΩ	Length, mass, time, and electrical resistance
	MKSC	Length, mass, time, electrical quantity
	MKSA	Length, mass, time, electrical current
	VAMS	Voltage , electrical current, length, time
5	LMTQP*	Length, mass, time, electric flux, and magnetic flux
	LMTIϕ*	Length, mass, time, electrical current, and magnetic flux
	LMTIγ	Length, mass, time, electrical current, and electric and magnetic coupling coefficient
	LMT$\epsilon\mu$	Length, mass, time, permittivity, and magnetic permeability